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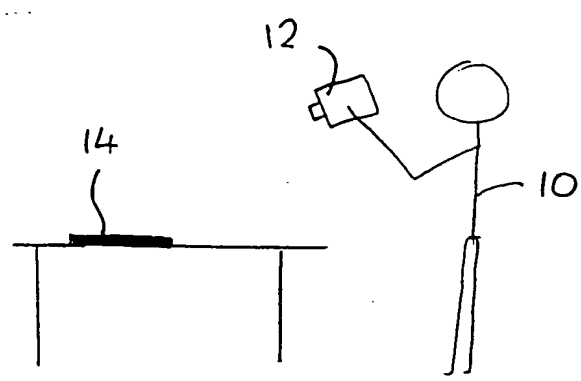


FIG. 1

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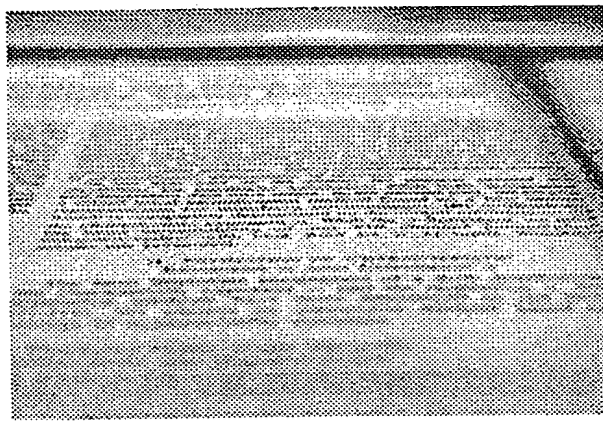


FIG. 2

dewarping →

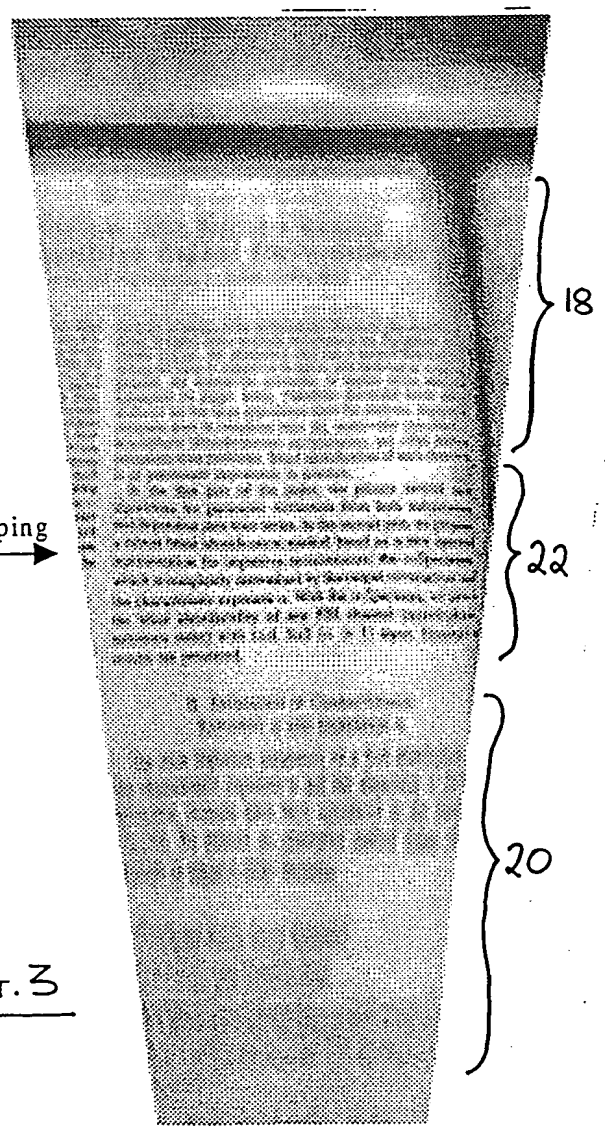
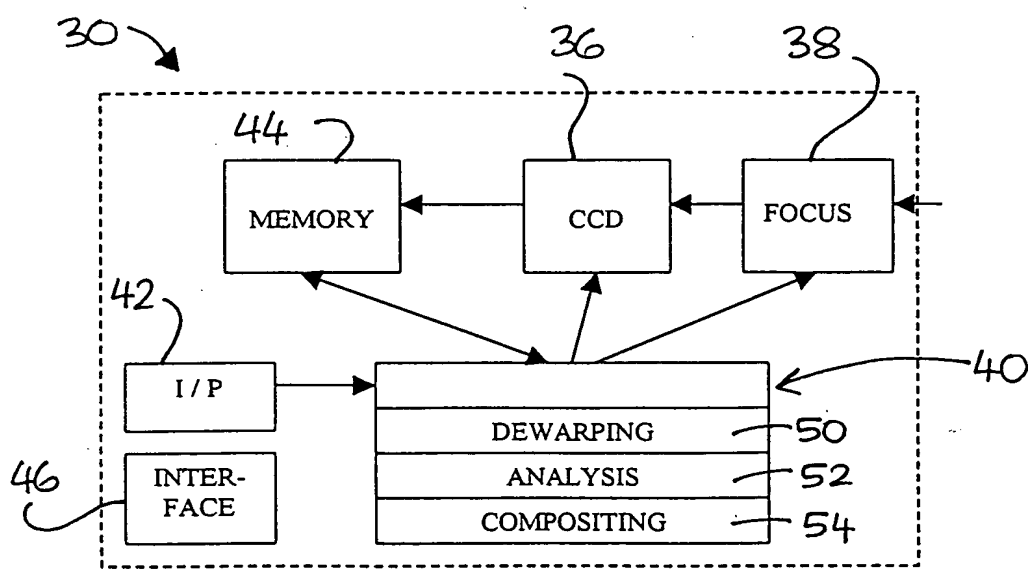
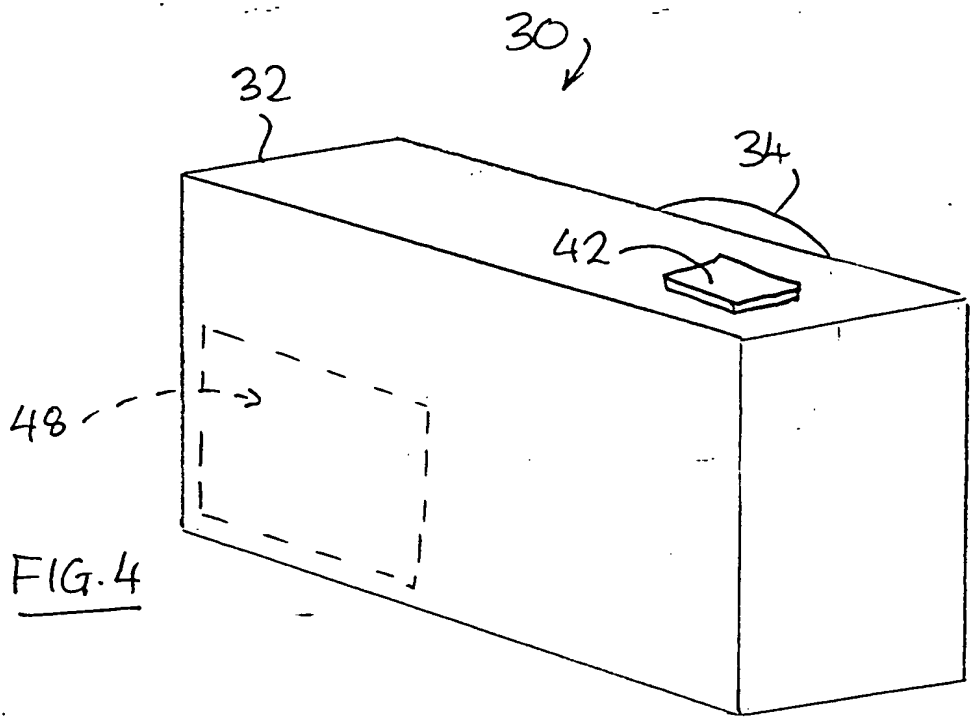


FIG. 3

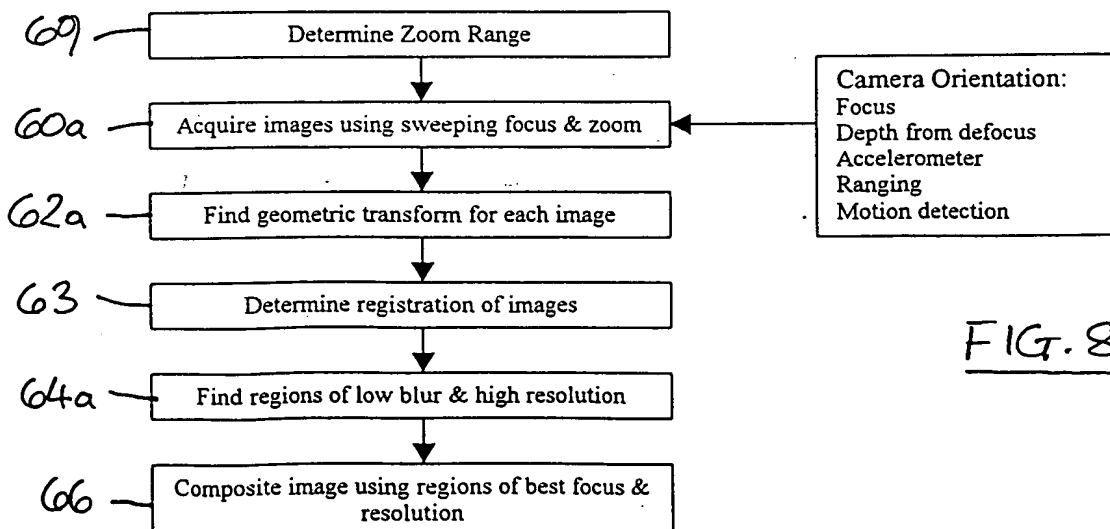
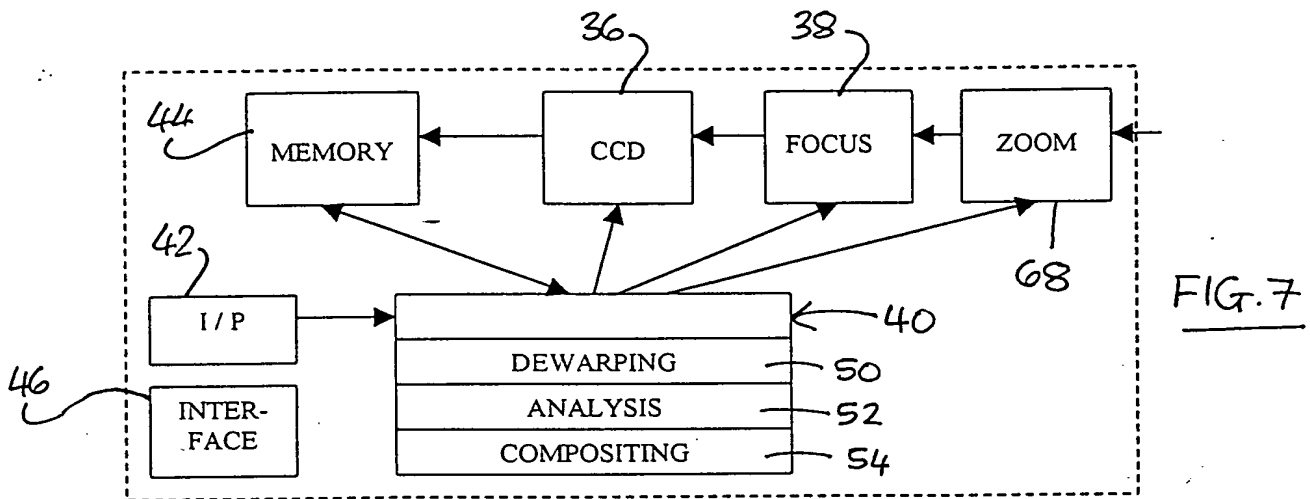
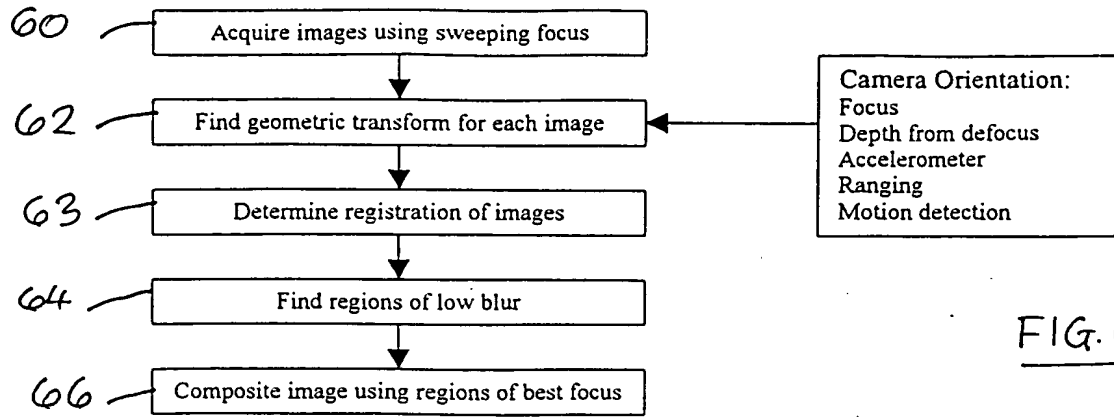
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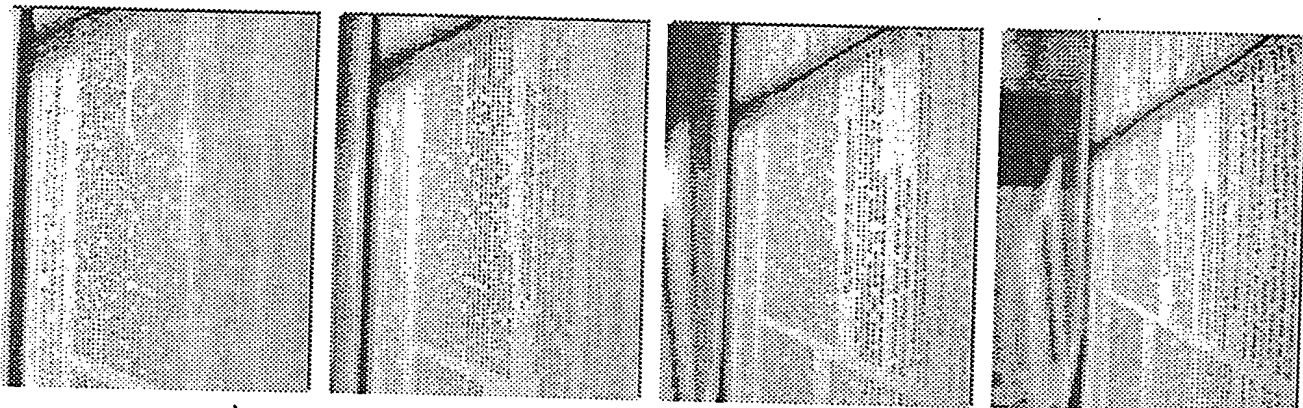
$\frac{F}{F}$

FIG. 9(a)

FIG. 9(b)

FIG. 9(c)

FIG. 9(d)



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on and Blind Channel ive Signal Environments

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second- or higher order statistics [4]. However, the theoretical basis of higher order moment estimators is the asymptotic normality [5], i.e., the estimation error has a normal distribution. When the input is impulsive in nature and modeled as an α -stable process, the asymptotic normality of higher order moment estimators no longer holds. Therefore, fractional lower order statistics are the most appropriate tool for analysis. Impulsive channels arise in telephone lines [6], underwater (line-of-sight) atmospheric (thunderstorms) environments, and other mobile communication environments. Blind identification of such channels is of paramount importance in practice.

In this paper, we propose a new algorithm for parameter estimation from both independent and dependent data time series. In the second part, we propose a robust blind identification method based on a new spectral representation for impulsive environments: the α -Spectrum, which is completely determined by the output covariance and the characteristic exponent α . With the α -Spectrum, we prove the blind identifiability of any FIR channel (finite-phase unknown order) with i.i.d. SoS ($\alpha > 1$) input. Simulation results are presented.

II. ESTIMATION OF CHARACTERISTIC EXPONENT α AND DISPERSION γ

The most important parameters of a SoS distribution are the characteristic exponent α and the dispersion γ . Several estimation methods have been introduced in the literature [3, 4, 7, 8]. We generalize these methods based on the concept of negative-order moments.

A. Fractional Lower Order Moments: Positive-Order and Negative-Order

It is known that a real non-Gaussian SoS random variable X with zero location parameter has finite fractional lower order moment [3]

$$E[|X|^p] = G_1(p, \alpha) \gamma^{p/\alpha}, \quad \text{for } 0 < p < \alpha \quad (1)$$

where $G_1(p, \alpha) = \frac{\Gamma(\frac{\alpha-p}{\alpha}) \Gamma(\frac{p}{\alpha})}{\Gamma(\frac{\alpha}{\alpha})}$, α is the characteristic exponent ($0 < \alpha < 2$), γ is the dispersion and $\Gamma(\cdot)$ is the Gamma function.

However, finite $E[|X|^p]$ also exists for $p < 0$. The proof for the one dimensional case is straightforward. If X is a real SoS random variable with probability density function (pdf)

$$f_X(x) = \frac{1}{\pi} \int_0^\infty \cos(xt) \exp(-\gamma |t|^\alpha) dt \quad (2)$$

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FIG. 10

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